The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII
No. 1353

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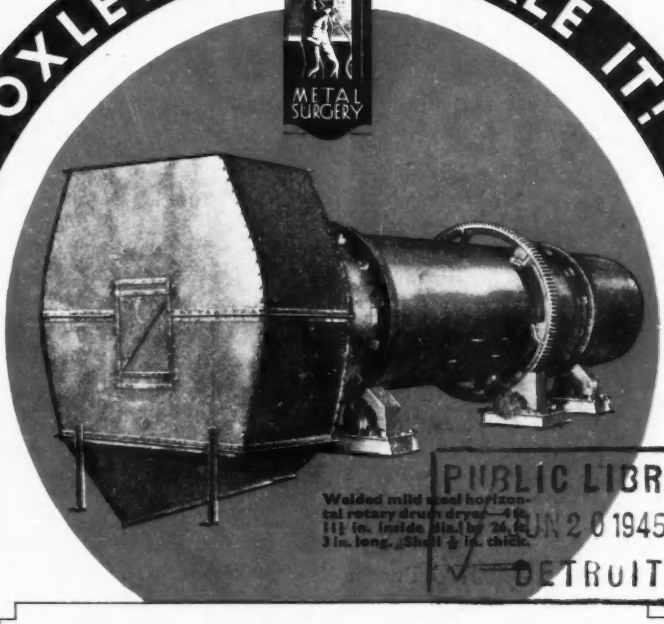

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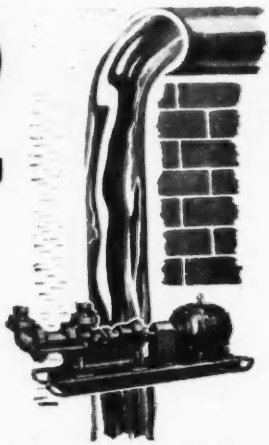

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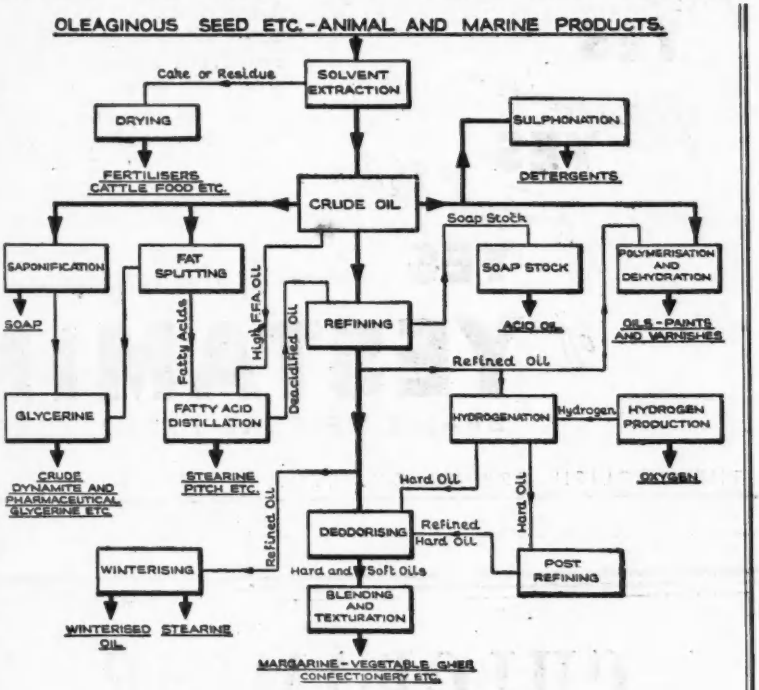

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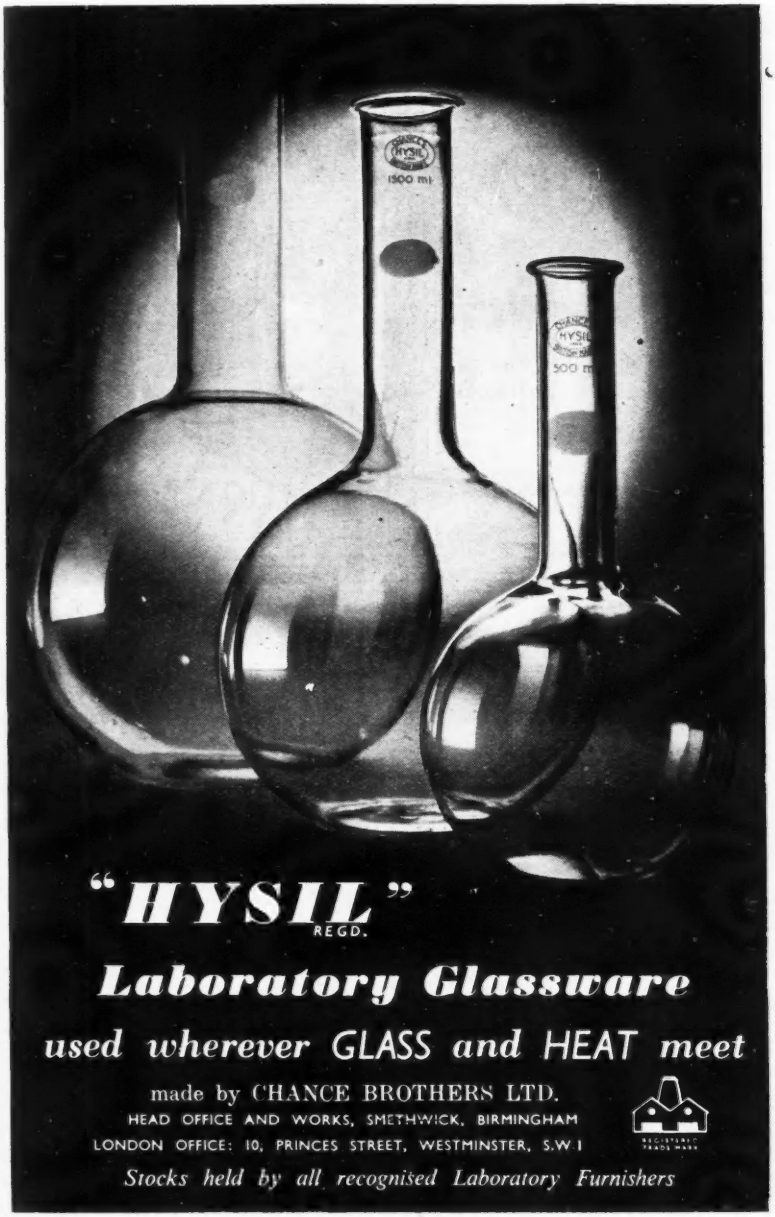

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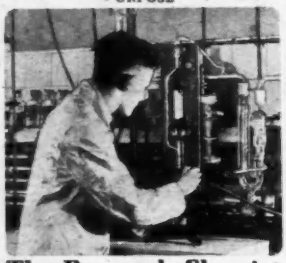

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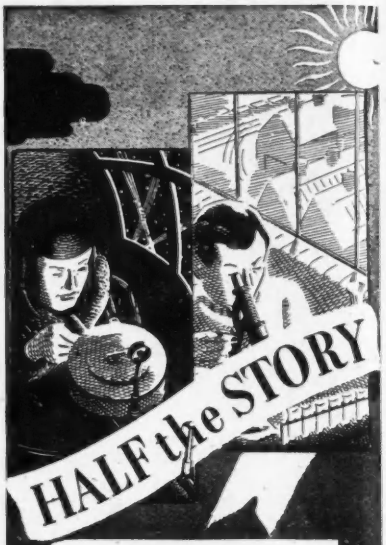

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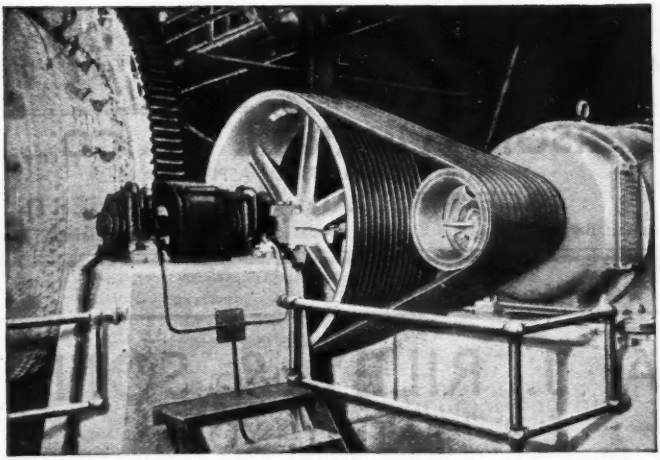

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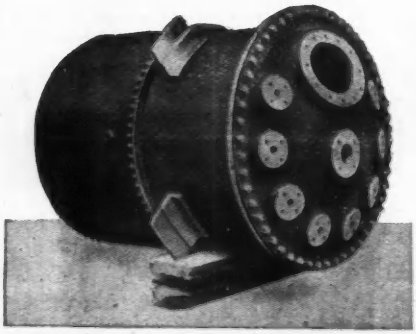

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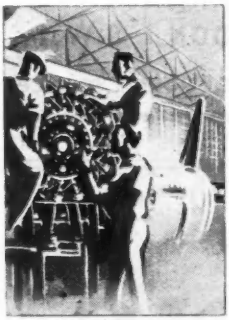

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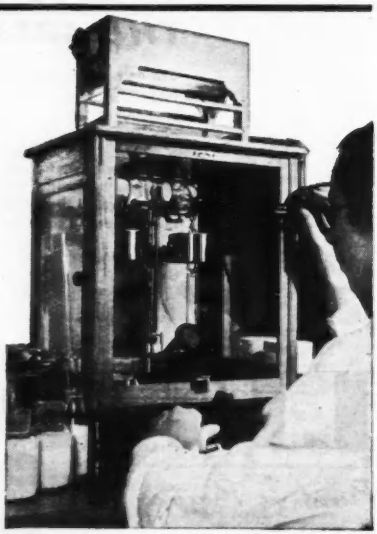

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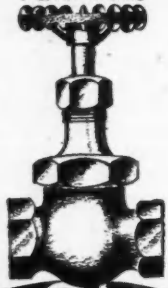

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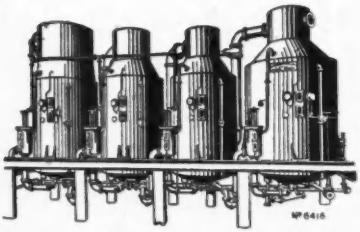

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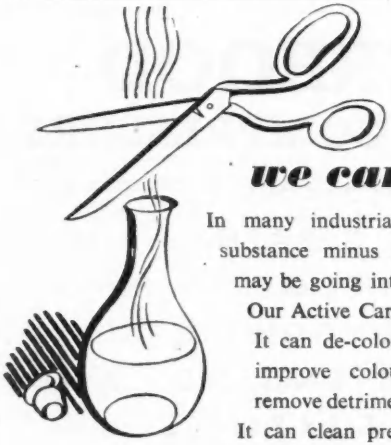

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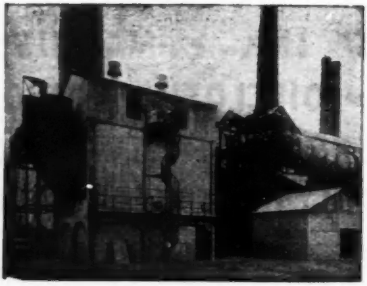

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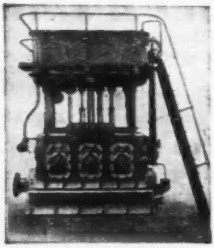

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June 2, 1945

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Industrial Alcohol

THE fact that a Government department finds it necessary to set up a Committee of Inquiry may generally be adduced as evidence that the facts are in dispute. Most reports of Government committees are therefore contentious. Sometimes the committee discovers that the facts are not in dispute and the report is unreservedly accepted. The Reid report on the coal industry was an example of a report which has been pretty generally accepted in its entirety by all concerned. Of all contentious documents of this character, one of the most contentious is that lately issued under the title "Removal of certain excise restrictions on distillation and of allowances on industrial alcohol and exported spirits," by a small committee under the chairmanship of Lord May.

Briefly, industrial alcohol and power alcohol have for many years received an allowance of 3d. per proof gallon in compensation for the increased cost of production due to the statutory restriction on concurrent brewing and distilling; and also 2d. a gallon allowance given in the 1921 Finance Act, "for the purpose of equalising the conditions as against the spirits of foreign manufacture." War experience has shown that these restrictions are no longer necessary and they have been removed. Since the new system of control has no effect on cost of production, the Treasury felt that the basis of the 3d. allowance had disappeared. The 2d. protective allowance appeared also to fall due for re-examination and the committee was appointed for the purpose of examining the whole matter. It should be made clear that the Government is not averse to making an allowance to industry, since the Chancellor has accepted the report of the Hydrocarbon Oils Committe and has given effect to the allowances there proposed in his latest Budget.

The May Committee found that during the period over which the 5d. allowance has run, the production of industrial and power alcohol has increased from 4.6 million proof gallons in 1920-1, to 9 million in 1928-9, and to 50 million in 1941-2. Some witnesses ascribed this rise wholly to the operation of the subsidy, but the Committee suggests that the increased production must have reduced costs and that the effect of the tax has been negligible in recent years. On the other hand, is it not also the fact that with reduced costs of

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production, the effect of the 5d. is mathematically greater, and may thus be very much more important now than it was in earlier years?

The allowance was not necessarily given on alcohol produced otherwise than by fermentation. The committee holds the view that considerable research has been done on other methods of producing alcohol (special mention is made of that of the British Oxygen Company, which is believed to involve the recovery of ethylene from coke-oven gas), and that so long as the older processes receive a subsidy, the newer processes will be handicapped. While every care must be taken not to destroy the industries that have been based on alcohol, especially in the export market, there is little doubt that a subsidy must not be used to bolster up an uneconomic process to the detriment of economic processes which can produce equally cheaply without a subsidy.

What the effect of the removal of the 5d. would be on alcohol usage and on alcohol-using industries remains uncertain. The producers of alcohol are unanimous in stating that the whole 5d. was passed on to the users; the users accept this. We deduce that the proceedings were not altogether harmonious, from the comment of the committee that the users "are . . . relying on the statements of their suppliers and are not in a position to check them." Moreover, the committee goes very deeply into the prosperity and profits of the Distillers Company with a view to showing that the period during which the subsidy was paid has been one of very great prosperity for that company. The producers all agree that the subsidy has caused the development of new industries based on alcohol, and that the advances in alcohol production and utilisation would not have been possible but for the subsidy. The prohibitive tariff against foreign alcohol has helped home producers materially. On the other hand, many interests representative of heavy chemicals, paints, colour and varnish, and artificial silk, agree that the subsidy has little or no effect on their business. The wording of the report suggests that the committee has failed to differentiate between industries in which alcohol costs are a high proportion of the cost of production and those in which the selling price of the goods is such that the cost of the alcohol used is a minor charge. The committee, however, does not doubt that the tariff exercised a material influence, but points to other contributing factors, such as the better organisation of the industry and the application of the results of much increased industrial scientific research. Its conclusion is that "on a review of the circumstances we can only express our conclusion that the claims made as to the effect of the allowance on the development of the using industries and of the British chemical industry as a whole are much exaggerated." We wonder. The truth here seems to lie at the bottom of a very deep well, and the committee has given little reason, save personal opinion, for its conclusion.

However, it must not be forgotten that all the dismal forecasts made by industry regarding the adverse effect of the removal of the subsidy are based on the assumption that the withdrawal of the allowance would result in a corresponding rise in the cost of industrial alcohol to using industries. The Treasury, supported by the committee, seems to take the view that the removal of the Excise restrictions and the development of new processes not based on fermentation will keep the price down. The 5d. is to be discontinued. The committee, however, convinced that the future effect is not clearly definable, recommends that the position shall be watched, and that, if any industry finds itself unduly handicapped by reason of increased alcohol prices due to this action, the Government shall consider giving special assistance. But the manner in which the conclusion is couched suggests that this is the last thing the committee would like to see done. The report, in fact, leaves us with the feeling that the committee has been unsympathetic to the producers of alcohol and feels that their opposition to the removal of the 5d. allowance is not based on economic necessity, but upon self-interest. This is a strange conclusion if the committee accepts, as it has done, the view that the 5d. has been passed on to the consumer. The plain fact is that we cannot afford to handicap our chemical industries, and if the increased cost of alcohol is found to do so, the *status quo* should be regained

without diffidence, face-saving or procrastination. It may very well be that the Treasury's hope that industry will find some way of meeting the emergency by the devolopment of newer processes will be justified.

The result of the Treasury's acceptance of this report will be a greater development of home-produced alcohol from sources other than imported molasses. One of the principal sources of alcohol might well be the ethylene produced by coal carbonisation. It is understood that at least two plants are already in operation for the recovery of this ethylene, and, if the removal of this 5d. makes as much difference as many witnesses consider, it cannot be doubted that a new important by-product has been added to coal carbonisation.

NOTES AND COMMENTS

German Chemical Plant

IN the pages of this issue we make an attempt, in the inadequate space at our disposal, to illustrate the present state of the German chemical industry as left by the Allied air attacks. So far as we know, we are the first trade or technical journal to draw attention to this aspect of German industry, which, both by reason of the amount of destruction caused and because of the quantity of plant still remaining in working order, must needs have an important bearing on the future policy of the Allies towards the defeated enemy. We make no apology for the fact that the photographs, in most instances, betray an American origin; indeed, we owe the Office of War Information of the U.S.A. in London a debt of gratitude for their courtesy and helpfulness. We should like to ask incidentally, however, what has become of similar pictures of German industrial plant which must have been taken by British war photographers. We gather, from a recent note in the *World's Press News,* that many British war photographs just disappear somewhere between the war area and Fleet Street. Our inquiries in "the proper quarter" in London were met with a blank stare and a confession of complete ignorance; it was as though the German chemical industry had never existed; or, if it had existed, was a matter of infinitesimal importance. We beg to differ; and we hope that if this note should reach the official eye, it may lead to a wider circulation of the pictorial facts, and consequently to a clearer knowledge of the industrial problems that will have to be faced in Europe.

Whither German Industry?

THE way in which the Allies are going to tackle the crucial problem of dealing with Germany's industrial system will certainly have a decisive influence on the chances of building a more peaceful world. There are two main schools of thought in connection with this problem: one, ignoring all the sufferings which Germany inflicted upon millions of innocent persons, still stands awestruck before Germany's perversion of efficiency and claims that there can be no prosperity on the Continent—or in the world—without an over-industrialised colossus in the heart of it. No doubt, certain firms or individuals who had a lucrative trade with Germany before the war are prepared to support this argument, for unfortunately not all have yet realised that far larger public issues are at stake. A re-industrialised Germany, occupying a key position in Europe, rich in natural resources and human skill, and populated by some 70 millions, is bound sooner or later to return to armaments production and to the path of aggression. This point of view is opposed by those who, with Mr. Secretary Morgenthau, advocate a wholesale conversion of Germany into an agricultural country. Despite all sectional opposition to this plan, the natural trend of events is moving in this direction, as more and more Germans will have to till the land or starve.

Policy or Drift?

ANOTHER step announced by our American Allies, who seem to have done most of the active planning on this

subject, has been taken by General Clay—General Eisenhower's administrative deputy in Germany—who stated that all war industries that cannot be switched over to the production of essential consumer goods shall be destroyed, while laboratories and research institutions will also be eliminated. It is regrettable that so far no evidence is available that Great Britain, which still bears the scars inflicted by aerial attacks launched from Germany, has formulated any clear-cut long-term policy. The need for this is all the more paramount in view of the likelihood that the U.S.A. may not maintain its occupation in Europe for very long. In a twentieth-century world, a policy of *ad hoc* decisions is bound to lead to disaster. Similarly, any attempts to differentiate between the "Western" and "Eastern" methods—whatever is meant by such nebulous expressions—may only provide a platform for a third German attempt at world domination.

France's Fuel Troubles

A SEVERE fuel shortage is barring the road to rapid reconstruction in the French chemical industries, which are producing very slowly in consequence. The position is particularly serious, since France has never been able to supply her own needs in coal. Last month the Minister of National Economy and Finance, Monsieur Pléven, on his return from the United States, told a Press conference that he had discussed this question in America and it had been agreed that the Sarre mines should start producing with all possible speed. American and French engineers would organise the mines and it was hoped that before long production would return to normal. Already German prisoners who are miners were being directed to the Sarre. Meanwhile, France must make the most of her own resources. The return of Alsace has given the country an annual production of 75,000 tons of crude oil, while in the Haute Garonne there are natural gas supplies amounting to 50,000,000 cu. m., which are being usefully harnessed to local industry. Investigations are also being carried out in the Petites-Pyrénées and it is believed that before long an appreciable oil supply will also come from there. France also has a number of factories in the north capable of an annual production of 15,000-20,000 tons of oil, as well as a number of others for the production of shale oil. Refineries in the Midi are intact and work can go ahead, supplemented, in addition, by supplies from Iraq.

Rations over the Pole

WHEN men take great risks in the cause of science, it is only just that their well-being should be assured so far as science permits. It is good to learn, therefore, that many of the newest devices of chemistry and physics were deployed on behalf of the crew of the aircraft *Aries*, whose sensational discovery of the true site of the North Magnetic Pole has been announced throughout the Press. Food and warmth were what had to be assured, and, for the first, the crew's ration packs were designed mainly in the form of blocks of compounded dehydrated foods. The aircraft carried emergency rations for a crew of nine, sufficient to last 28 days; and these were devised and prepared by the Low Temperature Research Station of the D.S.I.R. in consultation with the appropriate R.A.F. medical authorities. Four different menus allowed 3380-3550 calories per man per day. Each two days' ration was packed in a standard 4-gallon can, and these were gas-packed to ensure maintenance of condition. The total weight of the 14 cans was 435 lb., a most modest amount compared with usual emergency rations, and they made a pile measuring 66½ in. by 19 in. by 14 in. Many of the food blocks were made by hydraulic pressure in heavy steel moulds, and this work was done by a small part-time staff of Cambridge housewives. For cooking, a stove was designed to burn 100-octane spirit, as it was assumed that if the *Aries* was forced down some of the aviation spirit might be salvaged. Melted snow or ice would be available for reconstituting the dehydrated food; but actually many of the blocks were of such a texture as to be palatable when eaten uncooked, as sweets. As it turned out, the flight was without serious misadventure; but the assurance of a month's iron rations "in the bag" must have given the crew an extra feeling of security.

I.C.I.'s War Record

Lord McGowan's Review of Technical Achievements

LORD MCGOWAN, in his address last week at the annual general meeting of I.C.I., reviewed the company's achievements during the war. The enforced silence, which left the stage clear to those ready to seize any opportunity to attack the concern as "Big Business" and as one of the most efficient and successful examples of free enterprise, could now be removed and a vista has been opened up, surprising even to those who expected developments of a spectacular nature. Some of the major achievements of the company, such as Perspex, Gammexane, the weed-killer Methoxone, Mepacrine, and the company's contribution to the development of penicillin, are familiar to the readers of this journal. However, there are other and no less important advances to record over the whole field of the chemical industry.

In the fertiliser sector, to begin with, production of sulphate of ammonia increased from 200,000 tons a year before the war to about 500,000 tons, while output of "Nitro-Chalk" and of complete fertilisers was stepped up from 160,000 tons to over 260,000 tons in 1944. A new factory with an annual capacity of 240,000 tons of sulphate of ammonia was erected at Prudhoe, Co. Durham; the company's agricultural organisation played a leading part in the distribution of these products, while a national silage campaign brought about a five-fold increase in the production of cattle food.

Explosives

Turning to I.C.I.'s vast output of explosives, Lord McGowan revealed that seven new factories were built and operated on behalf of the Government, and that since 1939 these factories had turned out some 400,000 tons of explosives besides hundreds of millions of detonators, fuses, etc., including the filling for 90,000,000 incendiary bombs. The practice of modern quarry blasting was applied to the uses of war by the development of a plastic explosive (used in the sticky bomb and the "Flying Dustbin"), but the I.C.I.'s greatest contribution in the field of special weapons was the "Projector, Infantry, Anti-Tank"—better known as the Piat—the most effective weapon yet employed against tanks or fortifications. Delay-action detonators for aircraft bombs and the well-known soup-heating cartridge, fitted to over 10,000,000 tins (in co-operation with H. J. Heinz & Co., Ltd.), demonstrate to what extent and in what variety I.C.I. has contributed to the successful invasion of the Continent and the defeat of the enemy.

Lord McGowan.

Three of the Government's new small-arms factories were being operated and one was built by the company, which alone was responsible for building 17 major factories and several smaller ones, and for operating no fewer than 36. To these new plants 3345 trained staff and workpeople were seconded from I.C.I.'s own plants. These new S.A.A. plants, together with the plant at Witton, had turned out, by the end of 1944, over 3½ million rounds of ammunition. The metals division manufactured more than 67 types of field S.A.A. and numerous types of components for assembly elsewhere. At its peak, the finished metal production at the Witton plant alone averaged over 3000 tons a week throughout the year.

Condenser Tubes

The cupro-nickel condenser tube represented a notable contribution to the unparalleled achievements of the Royal Navy, as a large number of the bigger warships are fitted with these condenser tubes, while millions of tubes of aluminium brass—"Alumbro"—were supplied to auxiliary ships and to the Merchant Navy. The Soviet Navy was supplied with 200,000 of them, and, between 1942 and 1944, I.C.I. shipped to the U.S.S.R. thousands of tons of caustic soda, methanol bleaching powder, and other products, including Perspex. A new factory was built to manufacture metal fuel tanks, while flexible non-metallic fuel tanks were manufactured later by a subsidiary. Thanks to the company's research facilities and technical resources the company gained a leading position in the field of light metals.

Three plastic products have made history during this war: Perspex, polythene, and polyvinyl chloride, details of which have been given in our columns on previous occasions. Lord McGowan has now revealed that I.C.I. built two new Perspex plants for the Government with a combined capacity greater than that of I.C.I.'s plants, although

their own output increased tenfold. After the fall of Malaya a large polyvinyl chloride plant was also built for the Government. Without the large-scale provision of polythene as an insulating material, radiolocation could never have been developed so rapidly or so efficiently. This work was aided by the products of a subsidiary, Steatite and Porcelain Products, Ltd., manufacturing low-loss radio ceramics.

Organic Chemicals

In the field of organic chemicals, I.C.I.'s efforts have been so numerous and varied that the chairman found it difficult to summarise them; he singled out for reference, however, synthetic resins, and polymers, especially nylon. There were also, he said, chemicals which take the dye out of fabrics. A further range of products increases the power of textiles to absorb liquid, and others again render equipment proof against mildew or prevent the ropes used in arctic climates from icing up. In their dyestuffs division 300 full-time research workers were employed; in no other industry was there so high a proportion of trained scientists to workers.

Passing to what he called the "unpleasant side of organic chemicals," Lord McGowan revealed that his company acted as agent for the Government in making Britain ready to engage in gas warfare if this had ever been forced upon us by the enemy. For this the general chemicals division, with its special knowledge and technique in the production of chlorine, was chosen as the main instrument; enormous quantities of lethal gas had been manufactured and arrangements made for underground storage and for filling depots. It is a high credit to the company's organisation and precautionary measures that this programme was carried out without a single fatal toxic accident.

Aviation Fuel

A large new oil refinery was built in Lancashire, in co-operation with the Shell Group and Trinidad Leaseholds, and brought into operation within two years. This Government plant, together with the I.C.I. plant at Billingham, produced hundreds of thousands of tons of aviation fuel annually. A special fuel, known as Victane, was developed in 1944 at Billingham, which gave fighter planes up to 25 per cent. more power than any previous aviation fuel. By the use of this fuel—full technical information of which was passed on to our American allies—R.A.F. pilots were able to catch and destroy flying bombs in the air. A particular organic chemical was found which would give still greater speed with existing engines, a practical process for its manufacture was worked out by I.C.I. chemists, and the substance produced at a M.O.S. factory.

By no means the least satisfying feature of this war record, which the chairman called "fragmentary," was the virtually complete freedom from labour disputes, in spite of many new entrants. This is an indication both of the high standard of working conditions and of the harmonious relations with the trade unions, already referred to in the annual report.

Turning to the contribution made by the associated companies in the Dominions, Lord McGowan referred to the work of Canadian Industries, Ltd., notably the creation of the war-time subsidiary, Defence Industries, Ltd., whose entire rôle was the manufacture of explosives, S.A.A., and other munitions. From 110 persons employed in September, 1939, the staff increased to over 32,000 in the peak year of 1943. I.C.I.A.N.Z., Ltd., erected and operated for the Government of the Commonwealth of Australia four synthetic ammonia and nitric acid plants as well as other military explosive works, while at the same time producing in its own factories many types of ammunition and war chemicals, and operating Government-owned plants manufacturing Chlorosene (for anti-gas purposes) and sulphonamides. African Explosives & Chemical Industries, Ltd., established on a considerable scale the manufacture of military explosives in Africa, and sent 50 of their own technical staff to the aid of this country early in the war.

The Future

Having concluded his account of this remarkable war record, Lord McGowan gave consideration to the future, and the switch-over from war to peace production. "I am glad to be able to assure you," he said, "that the process will involve little delay as far as I.C.I. is concerned. Although we have necessarily had greatly to extend our plants which have been making products of direct war-time use, the majority of our works have played their part by continuing their normal peace-time production without which the other industries of the country and agriculture would have been short of essential raw materials. It is particularly fortunate that these plants are all intact and can revert to their civilian activities as soon as their output is no longer required for purposes of war. I must, however, make this reservation, that the operation of all our plants will depend on our ability to get the necessary raw materials. . . . The greatest of these is coal, and coal is the one product about which at the present moment there is most uncertainty as regards both supply and price. We are continually being told by responsible Ministers that Britain must export more and more if we are to import the necessities of everyday life, let alone meet the increased bill for social services. But how can we do this in a volume and at prices which other countries will pay if we are uncertain first of our supplies of coal and, secondly, of the price at which we can

buy them? I may tell you that I.C.I.'s coal bill to-day is £4,000,000 a year higher than it was in 1939, and we are disturbed at the prospects of being unable to obtain adequate supplies even at the increased price."

Coal was not the only uncertainty, he continued; they were still in doubt as to the Government's policy for enabling them to plan towards increasing the efficiency of their existing plants and erecting new factories. The immediate resettlement of the 15,000 of their people in the Services, as well as the many long-term schemes for improving the conditions and stability of employment in their industry formed part of their major plans for reconstruction. The human factor was foremost in their minds, but it must go hand in hand with a thorough overhaul and re-equipment of all their factories. These were formidable tasks; he assured his hearers that they did not underrate them and would face them with the same resolution as they had tackled those of war-time.

Free Enterprise

"I.C.I.'s war-time achievements are the result of the system of Free Enterprise," Lord McGowan concluded. "In certain quarters there is a disposition to consider that Free Enterprise has had its day and should now retire in favour of some form, which has never been clearly defined, of State Control. In my view, the suggestion that Free Enterprise has had its day is certainly wholly incorrect. On the other hand, I am of the opinion that Free Enterprise is on trial, make no mistake about that. We who believe in it must be ready to accept the challenge, and to welcome the opportunities the near future will give us to demonstrate the virtues of the system. We should not forget that it is a system to which America is committed and, if Britain departs from it, we should, I believe, soon feel the results in competition with the U.S.A. in the markets of the world. While I am a believer in Free Enterprise, I welcome the closest co-operation with the Government. What I ask is that the administration of business should be left to those who, by long experience, are most competent to handle it, and not be placed under the bureaucratic control which must inevitably result from national ownership or from State Control. The worst feature of the present cry for nationalisation is the uncertainty as to what the word means. I have nowhere seen anything approaching an exact definition of what is meant by it and what is to be substituted for Free Enterprise.

"One also hears much loose talk regarding combines and cartels, which is almost invariably based upon ill-informed generalisations on the part which they play in the industrial life of the country. Personally, I have not the slightest objection to an impartial investigation into the whole matter. Your company has never, either by virtue of its size or by arrangements with other manufacturers at home and abroad, engaged in what is called restraint of trade. We have always believed in high productivity which carries with it low selling prices—a policy which has been much appreciated by our many customers. Moreover, we live in harmony with others who produce articles similar to our own, and we do not seek to eliminate the small man. In our national, as in our international arrangements, I.C.I. has nothing to hide, nothing for which to apologise and nothing of which to be ashamed. On the contrary, it has a great deal, as I have tried to show, of which to be very proud."

Sintered Glass in India

A Growing Industry

SINTERED porous or fritted glass filters find extensive use in chemical laboratories, or, when made in bigger sizes, in the industrial field, for the large-scale filtration of corrosive liquids where the usual filters are unsuitable. The most important use for fritted glass at present is in the all-glass bacteriological filter for preparing sterile blood sera for transfusion.

Sintered glassware was manufactured principally in Germany before the outbreak of the war, but it is now being produced in America and the United Kingdom from Pyrex and Hysil glasses.

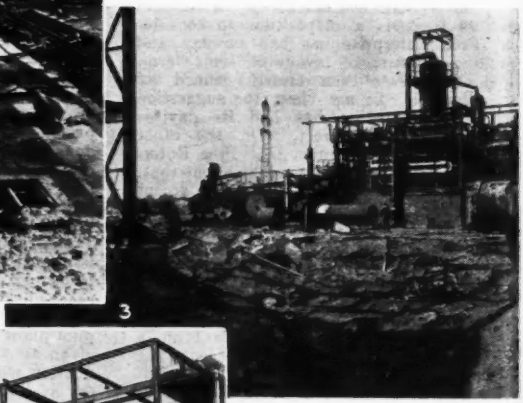
Work on the production of sintered-glass filters was taken up in the Indian laboratories of the Director of Scientific and Industrial Research, and, as Mr. Bh. V. Janakirama Rao points out in the March issue of the Indian *Journal of Scientific and Industrial Research*, a stage has now been reached where filters of the whole range of porosities required can be produced on a pilot-plant scale. Special consideration was given to the possibility of large-scale production with the raw materials and machinery available in India. The resistance glass manufactured by some Indian firms has proved to be quite satisfactory and the machinery required can also be fabricated without any difficulty in the country.

The process developed in the above laboratories (for which a patent has been obtained) entails making a paste of powdered glass with a binder, consisting of a viscous solution of cellulose ester, moulding the paste into the required shape and heating the moulded product for sintering and burning away the binder completely. When combination filters are desired, the different grades are similarly moulded, brought together in the desired sequence, and then pressed so that they may adhere together before firing. The sintering is carried out in an electric furnace.

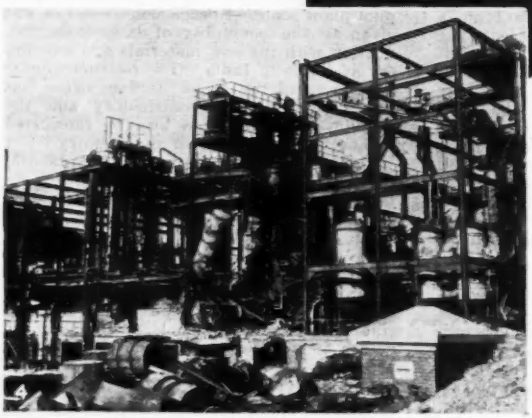
THE GERMAN CHEMICAL INDUSTRY TO-DAY

1. Stills and retorts of the bomb-damaged ammonia plant at Oppau on the Rhine. The foreground was occupied by experimental laboratories and greenhouses.

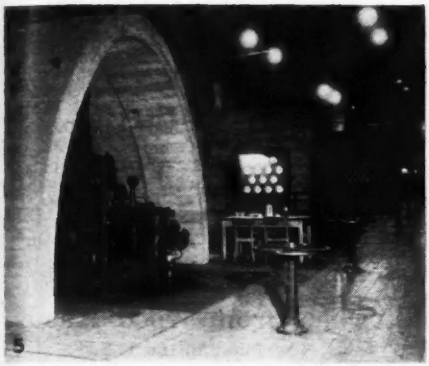
2. Another section of the vast Oppau works: one of the pumping plants in the "tank farm" for the storage of liquid industrial chemicals.



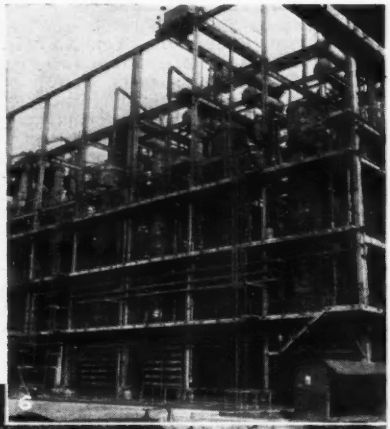
3. The Oppau synthetic oil plant, with a huge bomb crater in the foreground. Vigorous efforts at reconstruction were attempted here.



4. "Indigo Strasse" at Oppau: the ruins of the dyestuffs - manufacturing plant, with cooking kettles and retorts dislodged from their bases by Allied air attack.

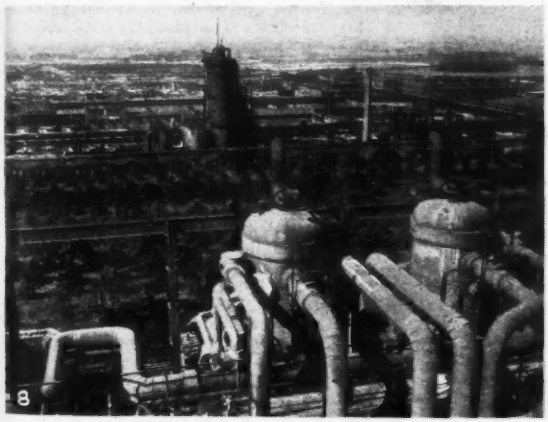


5. Some undamaged plant in the synthetic rubber works near Hüls, built in 1938, with concrete bomb-protectors covering each machine.



6. The acetaldehyde plant in the Hüls synthetic rubber works. These works, still turning out synthetic rubber, with a German staff, formerly employed 4500 slave labourers and 5500 German workers.

7. Plant of the Maschinenbau A.G. at Saarbrücken. The shattered piping formerly conducted gases from the coking plant to the blast furnaces.



8. General view of the Hüls works showing the camouflaged netting concealing a portion of the plant. This factory, one of four of its kind, was capable of turning out 4000 lb. of raw rubber a month, operating on two 12-hour shifts. It was captured intact by the U.S. 79th Division.

THE GERMAN CHEMICAL INDUSTRY TO-DAY

A CHEMIST'S BOOKSHELF

ANNUAL REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY, 1943. Vol. XXVIII. London: Society of Chemical Industry. Pp. 517. 20s.; to members, 11s. 6d.

It is no doubt indicative of the paucity of general information regarding the progress of applied chemistry that this volume should be slightly slenderer than its predecessor, but its indispensability as a work of reference remains. The sections dealing with plastics and with food far exceed in length any of the other chapters—a pointer showing the lines on which war-time chemical industry has been working. The largely unchanged list of authors betokens satisfaction with previous work; some of the teams have been slightly altered and Mr. J. Woolman, of the Brown-Firth Research Laboratories, has taken the place of the late Dr. Hatfield as author of the chapter on Iron and Steel.

It is perhaps not to be wondered at that progress in America still bulks largely in the subject-matter. In the very first paragraph of the book, Dr. Rumford remarks: "While such a development is inevitable in view of the restrictions on publication in this country, it is difficult to avoid the conclusion that the study of chemical plant design is being neglected, *or at least underpublicised here*." The italics are ours, and we feel that what is true of chemical engineering is also true of other branches of industrial chemistry, and that a remedy should be applied—and applied quickly.

The chapters on Fuel and on Gas, Destructive Distillation, and Tar deserve to be read with especial care at this stage of our chemical history. It has been repeatedly urged, and with the best of reasons, that we must utilise our coal to the best economic advantage. It was not without reason that Dr. Grumell chose "Conservation of Resources" as the subject of his Melchett Lecture to the Institute of Fuel. Messrs. Parrish and Snelling have contributed a lucid and well-balanced compendium of information on Acids, Alkalis, and Salts, in which we found the section on producing aluminium from clay especially interesting.

Space precludes our reviewing the other sections in the detail that they deserve; and it must suffice for us to say that we are lost in admiration, not only of the amount of practical knowledge displayed, but also of the way in which the authors have contrived to make this volume a valuable reference work without merely stringing together a collection of dry facts.

TIME, NUMBER AND THE ATOM. By R. Fortescue Pickard. London: Williams & Norgate. Pp. 92. 8s. 6d.

The author here introduces what is believed to be a striking new discovery regarding the structure of the atom. Briefly, he claims to have found that underlying the weights of the atoms, when these are arranged in order of magnitude, lies a series of patterns associated with the recurrence of certain numbers (the question of isotopes is taken into consideration). He shows that this is a fundamental characteristic of atomic structure, though the explanation of the reason why this underlying pattern in the weights of the atoms is to be expected remains to be found. The researches of the late Sir Arthur Eddington and Whitehead and Meitner's theory of alpha particles are referred to and expanded with certain facts leading up to the author's new pattern theory.

Alcohol from Wood Waste

New Plant in the U.S.

THE first commercial plant in the U.S. built to produce ethyl alcohol from sawdust and wood waste will soon be in operation, according to Representative Harris Ellsworth of Oregon, in which State the new project is located. The new plant will be one of the largest in the world, with an estimated annual production of 4,100,000 gallons of alcohol at a cost per gallon far below the present price. The sawdust and wood waste available for this purpose runs into millions of tons annually, and is estimated at 67 per cent. of the wood of American forests. The basic German process has been perfected by years of research under the direction of Dr. J. Alfred Hall, chief chemist of the U.S. Forest Service.

The plant, built by a private company at Springfield, Oregon, occupies a fourteen-acre site of land and the cost of $2,250,000 was financed through the U.S. Defense Plant Corporation. When the plant gets into operation about July 1, it is expected the daily consumption of 200 tons of sawdust will turn out 10,000 to 12,000 gallons of ethyl alcohol. The plant is designed to increase its output greatly and there are unlimited supplies of raw material ready for use in the near neighbourhood.

A protein yeast for feeding livestock (*see* THE CHEMICAL AGE, May 5, p. 397) is another important product. It is estimated that 450 lb. of yeast is obtained from one ton of sawdust. Tar, turpentine and other resinous products can also be extracted from the waste woods. Yet other uses which are still being studied and perfected are development of a tanning substance, to be used in processing leather; and a product known as wood iron, created by impregnation of wood under pressure. Synthetic plywoods are already immediate possibilities, and Mr. Ellsworth recommends that additional research be continued in this field. He said that utilisation of wood waste would increase by hundreds of "man-years" the potential employment in the forest service.

LETTERS TO THE EDITOR

Economic Position of the Chemist

SIR,—In an editorial comment in your issue of May 19 you refer to a statement given by Dr. Stoyle, enlarging upon "the American Chemical Society's excellent salary figures, from which it would appear that the starting salary of a graduate in the U.S.A. is about £325, rising after six months' experience to £381, with an average annual increment of £27 per annum up to the age of 50." This may appear "excellent" in our eyes, but is it so in the U.S.A.?

The day after seeing your comment I read the observations of a newspaper correspondent in San Francisco who relates that daily on his walk to the Conference he sees a notice outside a garage "Mechanics Wanted. We pay — dollars a month," equivalent, so the correspondent says, to £80 per month. So that after 21 years' experience and increments a graduate chemist in U.S.A. gets a salary equal to that of a mechanic who has only to apply for a job to get it.

Mechanics there may be graduates, too, but they would appear to have an economic advantage over chemists. Or is there a black market in mechanics to which a San Francisco garage must appeal?—Yours faithfully,

E. HINKS, F.R.I.C.

Spectroscopically Standardised Substances

SIR,—As the use of the spectrograph for the detection and determination of the metallic elements in all kinds of materials increased, there arose a demand for extremely pure metals, oxides and salts to serve as standards. About 1922, Dr. S. Judd Lewis suggested to me that Adam Hilger, Ltd., should supply for this purpose spectroscopically standardised substances; the proposal was immediately adopted, all arrangements for the supply of the substances and their analysis being in the hands of Dr. Judd Lewis. These pure substances have now become well known under the trade mark of "H.S." substances, and now include most of the more common and many of the rarer metals, as well as most of the rare earth oxides. The "H.S." substances were the purest obtainable from various research and industrial laboratories throughout the world, and many of them were prepared especially for inclusion in the scheme.

In 1932, when Dr. S. Judd Lewis[1] proposed the "ratio quantitative" method of spectrographic analysis, the "Specpure" series of "ratio powders," "ratio solutions," and pure salts was introduced, and now comprises more than 50 substances which are available in a spectrographically standardised condition. Every supply of "H.S." or "Specpure" material has always been accompanied by a full report of the results of chemical and spectrographic examinations made on that material. As far as possible, an estimate is given of the amounts of each trace element present, and reference is made to all the spectrum lines due to the impurities which have been detected.

In view of the ever-increasing demands for the substances included in these two schemes and for new additions to the list, the need arose for additional manufacturing and analytical facilities. Adam Hilger, Ltd., have therefore entered into an agreement with Johnson, Matthey & Co., Ltd., whereby the latter will in future undertake the supply of these substances and the control of their purity at their research laboratories, Wembley, Middlesex, where many of them will be made.

To cope with the additional work, Dr. Judd Lewis, who acted as consultant for Adam Hilger, Ltd., for many years, has been engaged in that capacity by Johnson, Matthey & Co., Ltd., and the staff of the spectrographic department of their laboratories has been augmented by the appointment of Mr. D. M. Smith, formerly in charge of spectographic investigations at the British Non-Ferrous Metals Research Association. The agreement made between Adam Hilger, Ltd., and Johnson Matthey & Co., Ltd., also provides that future sales of "H.S." and "Specpure" substances shall be made only by Johnson Matthey & Co., Ltd., from their head office at 73/83 Hatton Garden, London, E.C.1.—Yours faithfully,

F. TWYMAN, F.R.S.,
Managing Director,
Adam Hilger, Ltd.

[1] S. JUDD LEWIS, "Spectroscopy in Science and Industry" (Blackie).

Cylinder Valve Fittings

New British Standard

THE British Standards Institution has issued a revised edition of the specification on "Valve Fittings for Compressed Gas Cylinders." In the present revision no changes have been made in the basic dimensions of the outlet threads standardised in the 1931 edition, and interchangeability of connections with valves made to the 1931 edition or to the present standard remains. The Appendix on gauges has, however, been revised and certain modifications have been adopted on the recommendations of the National Physical Laboratory. The scope of the Standard has been extended by the inclusion of the dimensions and gauges for valves of 1.25 in. nominal size. Schedules giving the essential properties of the steel and bronze or brass are included, as well as the dimensions for valving capsules. Copies of this British Standard, B.S. No. 341 : 1945, may be obtained from the Institution, price 2s., post free.

Personal Notes

MR. H. N. SPORBORG, chairman of British Thomson-Houston Co., Ltd., is retiring after 43 years' service.

MR. C. G. HEYWOOD has been elected chairman for 1945 of Pinchin, Johnson & Co., Ltd.

MR. R. J. S. PERRY has been appointed technical secretary of the Information and Research Bureau of the National Lubricating Oil and Grease Federation.

MR. J. SUTHERLAND, after 26 years of service, has retired from the position of managing director of B. Laporte, Ltd., but has accepted an invitation to continue as a director.

MR. J. A. AMSCHEL has retired from the board of Lightalloys, Ltd., on account of ill-health, and MR. C. J. FEAR, secretary of the company, has been appointed in his stead.

MR. H. BILLINGTON, of Goodlass Wall & Co., Ltd., Liverpool, has been elected chairman of the Liverpool branch of the Industrial Transport Association, and MR. W. A. EDGE, of Samuel Banner & Co., Ltd., oil distillers and refiners, has been elected secretary. The newly constituted committee includes MR. R. McK. WALKER, of United Molasses, Ltd.

MR. E. E. BILLINGTON, B.Sc., M.Sc., F.R.I.C., managing director of Edward Billington & Son, Ltd., cattle food manufacturers and distributors, of Liverpool, has been elected president of the Liverpool Rotary Club. He is deputy chairman of the Animal Feeding Stuffs Buyers' Association, Ltd., and a member of the Advisory Committee for the control of molasses and industrial alcohol.

Obituary

MR. JOSEPH GEORGE ROBERTS, chief chemist with Shanks & Co., Ltd., sanitary engineers, died suddenly at Barrhead, Glasgow, on May 24.

PROFESSOR HANS FISCHER, who, *Chemical and Engineering News* reports, has died in Munich, aged 64, was professor of medical chemistry at Innsbruck and Vienna and in 1921 succeeded Wieland as professor of organic chemistry at the Munich technical college. He had worked on hæmin, the porphyrins, and chlorophyll and was awarded the Nobel Prize in Chemistry in 1930.

The death of SIR MARTIN ONSLOW FORSTER, D.Sc., Ph.D., F.R.S., F.R.I.C., the research chemist, at Bangalore on May 24, is reported from India. He was 72 years old. One of the distinguished company of chemists emanating from Finsbury Technical College and London University, Forster occupied the post of assistant professor of chemistry at the Royal College of Science in 1902-13, and was the first director of the Salters' Institute of Chemistry in 1918-22. At the early age of 32 he was elected a Fellow of the Royal Society, on the council of which he served in 1917-19. His fellowship of the Institute of Chemistry dated from 1898, and he was on the council of that body from 1905 to 1918, being vice-president in 1908-11 and 1915-18, while in 1918-19 he acted as censor. He was also honorary secretary of the Chemical Society in 1904-10, and treasurer in 1915-22, and he received the Society's Longstaff Medal in 1915. During the last war he acted as a director of that remarkable enterprise, British Dyes, Ltd., and in 1919-20 he was Prime Warden of the Worshipful Company of Dyers. After acting as president of the Chemistry Section of the British Association in 1921, he went to India in 1922, and held the appointment of Director of the Indian Institute of Science at Bangalore until 1933. Under his guidance, the Institute became one of the most progressive homes of science in India, and he received the honour of knighthood on his retirement.

CRYSTALLOGRAPHY SCHOOL

A Summer School in X-ray Crystallography will be held again (from September 3 to 14 inclusive) in the Department of Mineralogy and Petrology, and in the Cavendish Laboratory, Cambridge, by courtesy of Professor Sir Lawrence Bragg, F.R.S. It will provide an introduction to X-ray diffraction, so that those whose researches, whether in the universities or in industry, lie in the field of physics, chemistry, metallurgy, mineralogy, or biology may be able to recognise the problems to which these methods may be applied. The greater part of the course will be devoted to practical work. Section A will include further steps, theoretical and practical, in the study of crystal structures, while in section B some applications of earlier work to metallurgical problems will be studied.

A syllabus and form of application may be obtained from Mr. G. F. Hickson, Secretary of the Board of Extra-Mural Studies, Stuart House, Cambridge, to whom applications should be returned by June 23.

The Indian Government denies reports which have appeared in the Press that the I.C.I. purchased before the war a plant of German make having a capacity to manufacture 350,000 tons of sulphate of ammonia, which was erected in Manchester, but was found unsatisfactory and is now lying idle, and that the recommendations of the Technical Mission appointed to advise on the production of artificial fertilisers are designed to "dump" that plant in India.

Metallurgical Section

Published the first Saturday in the month

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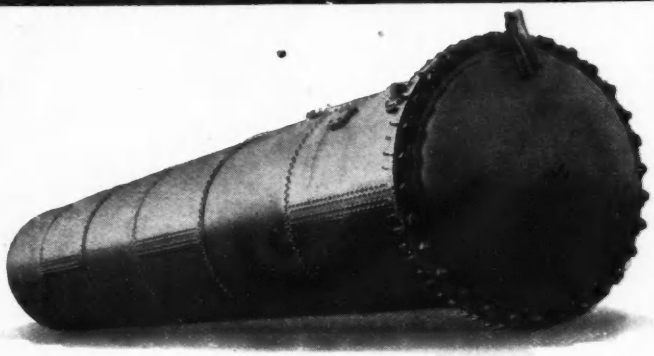

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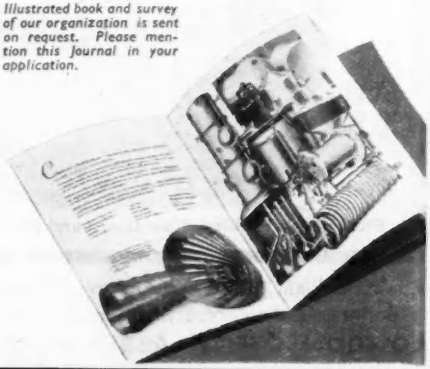

Metallurgical Section

June 2, 1945

Modern Treatment of Manganese

Wet Extraction and Deposition

by A. G. AREND

THE wet extraction and deposition of manganese has aroused more than a little interest lately, in view of the large deposits which are being worked in West Africa, and also the deposition of the pure metal for alloying purposes, a process introduced into the U.S.A. since the war. It is only fair to mention that similar deposition methods were applied at the final stages in this country nearly 20 years ago, but were abandoned.

In the process recently developed by the Electro-Manganese Corporation at Knoxville, it is stated that some 20 per cent. of the manganese was recovered at the anode in the condition of manganese dioxide, although it was otherwise deposited as metal at the cathode. It was this feature of imperfect deposition which for many years retarded the development of the electrolytic process, but it transpires that despite this known defect, as much as 1800 tons of electrolytic manganese were produced in 1943. Although this does not amount to much alongside the 3,000,000 tons of ore annually produced, the making of specialised alloys for aircraft, electrical resistance units, noiseless gears, and hardenable metals, etc., becomes possible only when perfectly pure manganese is available.

Before the war, it is doubtful whether the perfectly pure metal could be obtained, the nearest approach to this being the fused metal as prepared by ramifications of the Goldschmidt method, or electro-thermal processes. On the one hand, aluminothermy produced a metal which, although otherwise pure, contained a small percentage of aluminium, while electro-thermal manganese invariably contained carbon. Whereas carburised manganese can be oxidised in air, this is less noticeable when efforts have been made to remove the carbon, while electrolytic manganese is literally exempt from oxidation, and accordingly has recently been used for coinage in place of nickel. Nearly a century ago, Bunsen proposed the wet electrolytic production of both manganese and chromium, but as events have shown, it took long years to implement these methods.

In 1921, a firm here abandoned the plating of chromium, and at the same time gave up the idea of plating manganese, as it was recognised that certain practical details were lacking, and in their place, expensive cast magnesium alloys were used. More recently, chromium plating has become universally successful, but it is only since the war that the same can be said of manganese depositions. Electro-thermal methods, in which manganese oxides are reduced in furnaces of the type used for aluminium, have been carried out on a relatively small scale; the Krupp process uses ferro-manganese anodes in a bath of fused manganese salts, and alternative systems employ anodes of manganese oxides and carbon, but the metal recovered was never pure. It was of service only for specialised steel-making where the familiar spiegel and ferro-manganese would not suit. Electrolytic manganese has opened up a fresh field, as there are no limits to the uses which the pure metal can be put in conjunction with aluminium, zinc, copper, nickel, chromium, iron, etc.

Preliminary Treatment

In the large-scale process now used, the manganese dioxide obtained as the raw product is roasted at 500°-550°C. to convert it to manganous oxide, which is more readily soluble in acid, while the same heating renders the iron oxides insoluble. Naturally occurring manganese carbonate turned out to be less soluble than was expected, although dialogite and other minerals of the kind were tried. This system of direct dissolving differs from what was used in this country some years ago, as efforts were made to economise in the sulphuric acid consumed. Sulphide ores of manganese of the alabandite variety are somewhat rare, but artificially prepared sulphides are not difficult to produce, and these, on careful roasting, can be converted to the sulphate condition. The complete conversion of the sulphide to Mn_3O_4 at 680°C. is apt to be too readily accepted, as by dint of careful heating the extent of oxidation can be arrested and the sulphate condition maintained. The manganous oxide, or the carbonate, are most easily fused with sulphur to sulphide, but the dioxide can also be substituted, and on heating disengages part of the surplus sul-

phur as sulphur dioxide, and leaves a green powdered mass.

The roasting has then to be slowly performed in a muffled furnace using restricted air inflow, to convert the sulphide to sulphate. As with other roasted products of the kind, this is not entirely soluble in hot water alone, and requires the assistance of a small percentage of actual sulphuric acid, but the large consumption of acid, where the roasted dioxide ore, or carbonate, are used, is unnecessary, and thus a means of economy is afforded.

The earliest methods endeavoured to prepare the sulphate for electrolysis by continuously heating the native dioxide with concentrated sulphuric acid to form a pasty mass, and, by dint of keeping out water, iron pots sufficed for this purpose. A less known method is that of heating the dioxide with ferrous sulphate in the anhydrous condition, whereby manganese sulphate and ferric oxide can be obtained. The alternative chloride method of electrolysis has not been persevered with, and all attention is devoted to providing the sulphate as expeditiously as possible.

Before the present war-time process had been instituted, the deposits of manganese were powdery, separated from the cathode, and tended to float about in the electrolyte. At this time too much attention was bestowed on current efficiency, as current was more costly, and the deposit, of a more or less loosely adherent disposition (which at times dropped off as a powdery mass), could nevertheless show a current efficiency of 90 per cent. To-day, with a less favourable current efficiency of from 65 to 70 per cent., the strongly adherent pure metal is deposited, and is in a form suitable for industrial applications.

Preparing the Electrolyte

Even at a relatively early date it was realised that a weakly acid electrolyte was most desirable for the best depositions, and the solutions rarely contained more than 0.36 per cent. sulphuric acid. With the developments nowadays made with *p*H values, the electrolyte is maintained with still more exacting accuracy, thus forestalling unexpected variations which could hold up the deposition. In the method as described by R. S. Dean in 1941, impurities in the solution of the ore, such as arsenic and iron, were separated by the addition of hydrogen sulphide in small quantity. This was done as a preliminary measure, again in a very weakly acid solution, and the objectionably smelling liquor was filtered off with the assistance of selected filter-aids. The earlier worked process had perhaps some advantage over this although it necessitated a preliminary preparation.

This comprised first making manganese sulphide by precipitating a portion of the manganese sulphate solution with ammonium sulphide, filtering, washing, and directly adding in damp condition. By so doing, the objectionable odour was obviated, arsenic was easily separated, and, with experience, all iron could likewise be eliminated. These sulphides are sometimes difficult to filter owing to the almost colloidal condition of the precipitates, hence the reason for including a small proportion of diatomaceous earth, which assists filtration. A number of French patents cover methods for rendering the slimy mass more granular, while alternatively, filters of selected porous ceramic materials can simplify the work.

Where gaseous hydrogen sulphide has to be engaged, the liquor following filtration requires to be boiled to get rid of the surplus gas, with its characteristic putrid odour. Even where the manganous sulphide precipitant is substituted, it is advisable to boil the liquor before putting it to use as an electrolyte. The electrolyte used to-day contains 35 gm. manganese sulphate per litre, and from 150 to 200 gm. ammonium sulphate per litre.

This liquor is reduced before passing into the electrolysis bath by treating with sulphur dioxide to the extent of 1.10 gm. per litre. In this respect it is of interest to note how one class of electrolysis can be assisted by another electro-thermal process, as the latest methods of smelting zinc sulphide, and other sulphide ores, permit the collection of pure sulphur dioxide as a by-product. This entirely differs from the crude sulphur gases which are emitted from smelting, when using coal or oil fuel, and which at best can be collected in the form of sulphuric acid. With the clean electro-thermal system, efforts are made to dispose of as much sulphur dioxide as possible to pulp and paper makers.

Electrolysis

The electrolysis is then carried out in diaphragm cells where all features of anions and anolyte, and cations and catholyte, are followed with precision. At the moment, a freely porous diaphram, using canvas as the medium, is employed, but it is acknowledged that in future years, when more experience has been gained, a less porous type of diaphragm will be substituted. This is because the action tends to be held up by the too ready formation of manganese dioxide at the anode, whereas with a restricted form of diaphragm, more opportunity exists for the manganese to remain in solution for deposition on the cathode. Similarly, the present use of lead anodes is expected to be improved upon, as this is thought to be responsible for the adherence of the oxide, and the quantity of the latter might be reduced.

Current is applied at approximately 20 amp./sq. ft., and the same interest is not given to the voltage which previously was

maintained at about 3 volts, as this, although tending towards greater current efficiency, prevents the best deposition in the entirely metallic form. As it is, appreciable quantities of manganese from the catholyte circuit pass through the diaphragm and reach the anolyte. The cathode used is made from stainless steel sheet, and the manganese is deposited upon it to the extent of up to $\frac{1}{8}$ in., although often only half this thickness is obtained.

As the electrolysis proceeds, the depleted catholyte is mixed with the anolyte solution, which has become more richly acid as a result of the treatment, and is thus suitable for further leaching. There are thus two by-products from the electrolysis, namely, this acid liquor, and the precipitated manganese dioxide which forms on the anode. The latter is returned to the roasting process to be reconverted to manganous oxide, whereas by the earlier system it was more directly converted to manganese sulphate.

The electrolysis baths are fitted-up in the usual manner with overhead bus-bars and storage tank for housing surplus electrolyte. Before the modern American method was instituted as a large-scale process, it was customary to apply the current through the agency of an amperage-hour clock, as this kept a check on the then more readily formed manganese dioxide precipitate, and obviated the need for constant manual attention.

Conditions for exacting electrolysis, however, are to-day further improved by the advent of automatic *p*H meters, which prevent the acidity from rising or diminishing beyond fixed limits. Much of the electrolytic manganese is claimed to be 99.95 per cent. pure, a considerable advance over the deposits obtained by the earlier system, as these invariably contained from 1 to 2 per cent. of oxides which appeared to be almost consistently present. According to reports of the present-day process the sulphur content, which formerly amounted to some 0.3 per cent., has been reduced to 0.03 per cent.

This has eliminated the need for melting the metal with borax after electrolysis. The product remains indefinitely bright in air with no signs of tarnish, and, being dense and compact, although of relatively thin section as obtained from the cathode, is well suited for melting to form different alloys.

Applications

As details of the applications of pure manganese have already been published, these need not be repeated, but it should be noted that great expectations are held out for the alloy comprising 60 per cent. copper, 20 per cent. manganese, and 20 per cent. nickel, which is claimed to possess fatigue strength superior to that of beryllium-copper. In the soft condition, this alloy has a tensile strength of 80,000 lb./sq. in., but when hardened this is raised to 180,000 lb./sq. in.

Another alloy of interest, because of its ability to harden by heat treatment, is that composed of 44 per cent. iron, 26 per cent. manganese, and 18 per cent. chromium, which when cold-worked shows a hardness of approximately Rockwell C-30, but which, after heating between 500° and 600° C., is raised to Rockwell C-60. For resistance windings for electric furnaces and electric heaters, etc., manganese again takes a prominent part, and when these are required to be of the iron-free variety, the electrolytic type of metal is demanded.

Although the manganese content of both magnesium and aluminium alloys for aircraft purposes amounts to only some 1 to 3 per cent. in the ordinary way, this again requires the addition of the perfectly pure metal to ensure the most reliable physical characteristics.

New Zealand Ironsands

Potential Mineral Wealth

A REVIEW of our present knowledge of the New Zealand ironsands indicates that they are a potential source of iron, titanium and vanadium. Although they are often referred to as the "Taranaki ironsands," occurrences of this material are widely distributed on the Dominion's coast. For instance, the beaches of the North Island, from Wanganui to Kaipara Heads, contain a considerable percentage, while on the South Island substantial deposits occur on the west coast, as well as elsewhere. However, all attempts to utilise them, at least as a source of iron, have so far failed not only on account of the metallurgical problems involved in the fine-grained nature of the ore and its high titanium content, but also because the high production costs would have prevented competition in world markets with ores derived from massive titanium-free ores.

The whole question is analysed in an article by Mr. Brian Mason, published in the March issue of the *New Zealand Journal of Science and Technology*. He concludes that unless a process can be devised of how to obtain the other elements, as well as iron, economically, there seems to be little hope of working these deposits in competition with iron ores from other parts of the world. A solution may be found in the adoption of recent overseas developments, such as modifications of the traditional blast-furnace practice to utilise high-titanium ores and new electric smelting and direct reduction techniques. However, before the advantages of the large New Zealand ironsand deposits, such as easy access and separation, can be made use of, much careful surveying, and further research and pilot-plant experiments will be necessary.

The Importance of Steel

An American View

The post-war outlook for steel, and questions connected with the light metals and plastics and their probable effect on the use of steel, were recently discussed by Mr. L. S. Hamaker, of the Republic Steel Corporation, Cleveland, Ohio, U.S.A. He said that aluminium capacity in the U.S. has shown a sevenfold increase since 1939, while magnesium capacity rose 70 times. Aluminium production capacity totalled about 1,500,000 tons yearly. On a two-for-one weight basis this might displace 3,000,000 tons of steel, which would be a serious but not a crippling blow to an industry with a capacity of 100 million tons per annum. As to the aluminium industry's raw material resources, the speaker maintained that the visible supply of high-grade bauxite in the U.S. could last only two or three years at the current rate of consumption. Basic aluminium production after the war would be pushed by competition into those areas where electric power rates are low. Although aluminium can be alloyed with other elements to increase its strength, steel is successfully counter-attacking through proper alloying and heat-treatment by which a tensile strength of over 500,000 lb./sq. in. can be achieved, while aluminium alloys have a tensile strength of only 80,000 lb./sq. in. Magnesium, the annual U.S. production of which is 265,000 tons, will hardly achieve a wide use as a structural metal because its physical properties limit its use, and all government-owned plants have been or will be, according to Mr. Hamaker, shut down.

Steel and Plastics

Plastics, which have had a spectacular development in recent years, will be complementary to steel, rather than competitive with it. In fact, where strength is required, many so-called plastic products are being moulded round a steel core. Plastics have some major physical shortcomings which make it improbable that they will be used for structural purposes. The strongest plastic material has a tensile strength of only 30,000 lb./sq. in. and is inferior to metals in strength, impact, and flexibility. Plastics lack surface hardness and offer poor resistance to abrasion. They cannot be used at continuous temperatures above 200° C., and frequently much lower temperatures lead to embarrassing problems. Their advantages are adaptability to built-in colour, surface permanence in ordinary use, low specific gravity, resistance to corrosion, good electrical insulating properties, etc., but the speaker doubted that they would exercise any adverse effect on the position held by steel.

METAL NOTES

"Hard Chromium-Plating of Steel" (Amendment List No. 1) has just been published. (DTD Specification 916).

* * *

In Yugoslavia, two antimony mining companies have been placed under State administration.

* * *

A U.S. patent for the production of a special corrosion-resisting steel, and another patent for the impregnation of steel with alloys were acquired by Colvilles, Ltd., the chairman revealed at the general meeting.

* * *

The Alloy Casting Corporation, Youngstown, Ohio, has taken out a patent for the so-called "spinning method" for large steel castings. The advantages of casting steel by this centrifugal process instead of by the "static" process—that of merely pouring the metal into stationary moulds—are that the centrifugal process produces a more uniform quality and a much better yield from molten steel.

* * *

Experiments with thorium as a hardener in alloy steel, carried out in Germany (Cornelius, *Arch. Eisenhüttenw.*, 1943, 17, 25) have led to the conclusion that the addition of more than a few tenths per cent. (up to 1.4) is disadvantageous. If thorium could be obtained at a suitable price and in sufficient quantity it would appear to be useful in preventing intercrystalline corrosion of austenitic steels.

* * *

The use of tungsten in high-speed tool steels has been restricted in the United States on account of new urgent military programmes requiring large quantities of tungsten, class A high-speed has been defined as an alloy steel containing not less than 0.6 per cent. carbon and 6.75 per cent. or less tungsten, and more than 3 per cent. molybdenum. Class B high-speed steel is any alloy steel containing not less than 0.55 per cent. carbon and more than 12 per cent. tungsten.

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General News——From Week to Week

Believed to be the last of the Lincolnshire woad farmers, Mr. Thomas Booth has died, at the age of 86, at Woad Farm, Kingsway, Boston.

Ten new Fellows have been elected by the board of the Institute of Physics, and 32 new Associates, according to the announcement dated May 23. Eleven subscribers and 19 students were also admitted.

Membership of the Plastics Group of the Society of Chemical Industry is now about 600, as compared with just over 400 two years ago, the hon. secretary reported at the annual general meeting.

The Midland Chemists' Committee, which organised a Chemists' Day in Birmingham on May 26, again discussed the possibility of providing a technical institute where scientific workers might gather for the exchange of views and information.

The establishment of a world body of scientific workers to co-operate with international trade-union organisations was commended last week by Professor P. M. S. Blackett in his presidential address to the Association of Scientific Workers.

Edinburgh University has accepted an offer by T. & H. Smith, Ltd., manufacturing chemists, Edinburgh, to endow a prize to be awarded each year to the most distinguished honours graduate in chemistry. The prize of the annual value of £10, is to be known as the Blandfield Prize.

Whale oil, refined hardened deodorised, 46/48°, is raised in price to £52 10s. per ton (naked ex works) in the Ministry of Food list of prices to primary wholesalers for the eight weeks ending July 21. Among imported animal fats, Empire stearine stands at £61 per ton c.i.f. in soft wood barrels (£64 5s. in hard wood); South American premier jus, £73 15s. and oleo oil, £70, c.i.f., duty paid (45s. per ton less in soft wood barrels).

To reduce the number of sizes of light-sensitive film and paper for recording instruments, thus facilitating the supply of material from stock, a specification has been issued by the British Standards Institution (B.S. 1193: 1945) after a detailed survey of the range now in general use. While it may be possible for some users or manufacturers of recording instruments to make changes to permit of the use of the scheduled sizes, it may be necessary for special current sizes to be made available for a few years. As far as new recording instruments are concerned, it is to be hoped that they will be designed to use one of the sizes of recording materials now standardised. Copies may be obtained from the Institution (price 2s., post free).

During the four years which have elapsed since its last meeting (as recorded in our last issue), the Hull Chemical and Engineering Society has lost by death two past presidents, Mr. R. A. Bellwood and Mr. R. Nelson, as well as two members, Mr. D. Duncan, R.A.F.V.R. (killed on active service), and Mr. H. M. Cooper (killed by enemy action).

At the annual general meeting of the Electrodepositors' Technical Society which took place at the Northampton Polytechnic Institute, London, E.C.1, on Monday, May 28, Dr. J. D. Jevons, F.R.I.C., presented a paper on "Pressing Technique as a Preliminary to the Production of Good Electrodeposits." During April, 20 new members were admitted, including three from Eindhoven, Holland.

In the April examinations for the Fellowship of the Royal Institute of Chemistry, the following have passed: in Branch A: Inorganic Chemistry (with special reference to the analysis of ferrous and non-ferrous metals), W. J. Bayley, B.Sc., G. R. Sutcliffe; in Branch C: Organic Chemistry, N. R. Davies, B.Sc., E. W. Mills, B.Sc., B. E. Wilde, B.Sc.; (with special reference to high polymers), S. H. Pinner, B.Sc.; (with special reference to terpenes and synthetic perfumes), J. Pickthall; in Branch E: The Chemistry, Including Microscopy, of Food and Drugs and of Water, R. H. Jackson, B.Sc., B.Pharm., A.R.I.C., L. G. L. Unstead-Joss, B.Sc.; in Branch G: Industrial Chemistry (with special reference to paper making), J. Keaton; (with special reference to power-station operation and practice), D. Haigh, A.R.I.C. In addition 43 candidates, including six women, have passed the examination in General Chemistry for the Associateship.

Foreign News

In Haiti, U.S. oil companies are engaged in exploratory drillings.

The prices of all chemicals in France have been increased by 30 per cent. to meet increasing costs of production.

The Egyptian Government is concluding negotiations for the purchase of 300,000 tons of Chilean nitrate.

DDT has been brought to Bucharest in limited quantities and it is reported that the Minister of Health is studying the possibility of its manufacture in Rumania.

Oil found in Eastern Holland during the German occupation will help to ease the coal shortage in that country. Borings have proved the oil deposits to be more substantial than was at first thought.

Sicily's two principal citric acid plants escaped damage during the war, and production was normal last year. Exports totalled 5300 quintals.

New restrictions have been imposed in the United States on the use of cadmium on account of military demands for cadmium as a corrosion resistant in surface plating metals.

A plant has been constructed in Juarez, Mexico, for the production of calcium arsenate to meet the needs of cotton growers. One metric ton of calcium arsenate and 100 kg. of arsenic acid will be produced daily.

The U.S. Government is considering the acquisition of German patents held by the Custodian of Enemy property as part of the reparations settlement, the *Financial News* reports.

Styraloy is the name of a new chemical compound made from styrene and butadiene by the Dow Chemical Co. It floats on water, can be worked like wood, has exceptional dielectric properties and lends itself to all forms of plastic fabrication.

The Australian Commonwealth Carbide Co. is recommencing the manufacture of carbon black at Electrona, Tasmania. Unfavourable marketing conditions caused production to be suspended about ten years ago. New plant is now being installed to produce about 150 tons per annum.

About 100 million Oxford units of penicillin per month are being produced in the U.S.S.R., states the Assistant Chief of the Red Army Epidemiology and Hygiene Research Institute, Col. Ginsburg, who added that an original method of production had been developed.

The A.N.I.C. (Azienda Nazionale Idrogenazione Combustibili, Milan) belonging to the Montecatini group, has reduced its gross dividend from 7 to 6 per cent. on the share capital of 750,000,000 lire. The company's Leghorn hydrogenation plant was dismantled and removed to Germany during the war.

The use of pure oxygen for blast-furnace operation and catalytic combustion methods applied in other fields of the steel industry were predicted before a meeting of the American Society of Mechanical Engineers by Mr. Martin S. Conway, who also suggested that alloy and stainless steel could be more cheaply produced by the open-hearth process than by the electric furnace.

An elaborate scheme has been evolved for establishing an industrial city on the Godavari River in Hyderabad, near the coalfields, iron ore and other mineral deposits, said Sir William Barton in a lecture before the East India Association. It is proposed to develop the steel, coal, cement and rayon industries. The production of calcium carbide, of fertilisers and of plastics, forms also part of the scheme.

Bottled propane gas is being manufactured by a Canadian firm at a plant in Talara, Peru. It is distributed in steel cylinders by a Peruvian firm to approximately 1000 homes and 200 commercial houses throughout the country.

The Venezuelan customs classifications and rates of import duty on industrial chemicals were changed by Resolution No. 25 of the Ministry of Finance, effective from February 19. In general, duties on chemical raw materials for industrial purposes were reduced to a fraction of their former rates, and a large number of new classifications, covering specific products were created.

Increasing industrial demand for mica in Australia has led to a thorough investigation of possible sources. The Western Australian Department of Mines has just issued a Bulletin (No. 2), by R. S. Matheson, listing the principal deposits in the State. High-grade muscovite has already been mined in the North-West Division, at Yinnietharra, and a plant has been installed, says Mr. A. H. Panton, Minister of Mines.

A quadripartite Glossary of Welding Terms —German-English, French-English, Russian-English, and Spanish-English—has been compiled by Mr. M. A. Cordovi for the American Welding Society, 33 West 39th Street, New York, 18. This serves as a most convenient tool to the non-professional translator when dealing with foreign publications on welding, and contains many technical terms not to be found in the usual technical dictionaries, to which it makes an admirable supplement.

The International Nickel Company of Canada announces the formation of a delegate board of directors of the Mond Nickel Company, of which company International Nickel is the sole director and manager. Mr. D. Owen Evans, a vice-president of International Nickel, who has been delegate director of the Mond Nickel Company since 1929, will be chairman of the new delegate board, to which the following have been elected: Mr. L. H. Cooper, Dr. W. T. Griffiths, Mr. A. P. Hague, and Lt.-Col. E. Pam.

Sicilian sulphur production was seriously affected in 1944 by war conditions. In the fiscal year 1942-43, 74 of the existing 150 mines were in operation, but in 1943-44 the number was reduced to 30, Reuter learns. Production, which had averaged 300,000 metric tons annually during the five-year period 1937-41, dropped to 93,000 tons for the fiscal year 1942-43, and to 9441 tons in 1943-44. Many mines were flooded, and new equipment which is required cannot now be furnished. Insufficient electric power and lack of shipping facilities are also affecting mine operation. Exports amounted to 20,880 tons last year, most of which was shipped to North Africa.

According to official statistics, ten concerns undertaking the production of caffeine now exist in Brazil. Of these six extract this product from maté, two from cocoa and two from coffee. Brazil's total output of caffeine for 1944 was placed at 200 tons, which could be easily raised to 300 tons, it is believed, if the industry could obtain larger supplies of imported chemicals.

The chief office of I. G. Farben, a large building in the northern residential district of Frankfurt-on-the-Main, has the honour of being occupied by General Eisenhower and the headquarters of SHAEF. The statement is made that the building is practically undamaged by bombing, an ironical comment on the fact that neighbouring residences were being vacated as early as 1937, as likely to be "unhealthy" in the event of an outbreak of war!

Several French firms, THE CHEMICAL AGE'S Paris correspondent understands, particularly those in essential oils, are much worried about heavy black market stocks. These were bought at a time when official supplies were at zero and the only way to keep going was by recourse to the black market. Prices up to four times above normal were paid for lemon-grass oil and similar imports, large supplies of which went underground immediately after the Armistice. Now that peace has returned, these firms are likely to find themselves saddled with stocks for which they paid much too highly.

Forthcoming Events

June 5. Electrodepositors' Technical Society (Midlands Centre). James Watt Memorial Institute, Great Charles Street, Birmingham. 6 p.m. Messrs. H. Roebuck and A. Brierley: "The Tainton Electro-Galvanising Process for Brylanised Wire."

June 6. Society of Chemical Industry. (Nutrition Panel, Food Group). Rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1. 2 p.m. General business meeting. 2.30 p.m.: Dr. D. P. Cuthbertson: "Protein Hydrolysates—Their Preparation and Clinical Uses."

June 7. Society of Chemical Industry. (R. & B. M. Group). Gas Industry House, 1 Grosvenor Place, London, S.W.1. 4 p.m.: Annual general meeting. 4.30 p.m.: Messrs. E. R. Hatt and W. R. Peard: "Co-operative Research in the Road Emulsion Industry."

June 9. Association of Scientific Workers (Leeds Branch). Philosophical Hall, City Museum, Park Row, Leeds. 2.30 p.m.-5.30 p.m.: Open conference: "Science and Education." Opening speaker: Sir Robert Watson-Watt, F.R.S.

June 12. Chemical Engineering Group (S.C.I.) and **The Institution of Chemical Engineers.** Rooms of the Geological Society, Burlington House, Piccadilly, W.1. 2.30 p.m. Mr. L. W. Needham and Mr. S. Lynch: "The Use of Suspensions as Heavy Liquids."

Company News

Eucryl, Ltd., reports a trading profit, for 1944, of £46,894 (£35,396).

Tate and Lyle, Ltd., announce an unchanged interim dividend of 3½ per cent. for year to September 30, 1945.

Lovering China Clays Co., Ltd., has made a profit, before taxation, for the year ended March 31, of £18,348 (£16,717).

The Burmah Oil Co., Ltd., reports a net profit of £2,728,483 (£2,230,135) for the previous year. The total dividend is 12½ per cent. (same).

Timothy Whites and Taylors, Ltd., have declared a second interim dividend of 22½ per cent. (same), making a total for 1944 of 30 per cent. (same.)

Griffiths Hughes Proprietaries, Ltd., announce a consolidated profit, for last year, of £423,706 (£349,773). A final of 8 per cent. (6 per cent.) brings the total up to 10 per cent. (8 per cent.).

Venezuelan Oil Concessions, Ltd., report a net profit, for 1944, of £688,329 (£492,262). A final of 1s. 9d. (1s. 7d.) bring the total dividend up to 2s. 6d. (2s. 3d.) per 13s. 4d. share.

New Companies Registered

Carbon and Graphite (Products) Association, Ltd. (395,563).—Company limited by guarantee without share capital. Original number of members not to exceed 25, each being liable for £10 in the event of winding up. To promote and protect the interests of British manufacturers of carbon and graphite products with due regard to the interests of the public. Each of the first members may nominate a member of the council. The first members are: Morgan Crucible Co., Ltd.; General Electric Co., Ltd.; Reckitt & Colman, Ltd.; James C. Waterhouse, Ltd.; Ever-Ready Co. (Great Britain), Ltd.; Ship Carbon Co. of Great Britain, Ltd. Registered office: 1 Old Broad Street, E.C.2.

Chemical and Allied Stocks and Shares

FOLLOWING a further set-back in markets towards the end of last week, the tendency became steadier, although a disposition to await the result of the General Election restricted the volume of business. Nevertheless, there was a little buying of

industrial shares, the earlier decline in prices proving attractive. In most instances, however, only part of last week's set-back was regained. British Funds have been steady, in the belief that, irrespective of the result of the General Election, maintenance of the cheap money policy can be confidently expected.

Imperial Chemical were 38s. 6d. after 38s. 3d., and Turner & Newall 79s. 3d. after 79s., while British Plaster Board gained 1s. 3d. at 36s. 3d., following a decline to 35s. B. Laporte have been steady at 88s. 9d. on the full results, which show that earnings on the shares exceed the maintained 15 per cent. dividend by fully 8½ per cent. At their current level the yield is small, but this reflects recognition of the company's progressive record; it is being assumed in the market, moreover, that when further capital is required, shareholders are likely to be offered additional shares on favourable terms. Distillers have rallied well to 113s. 6d., or 6s. 6d. above the lowest level recorded last week; the results, due shortly, are expected in the market to make a good showing. In some quarters there has been talk of a possible increase in the dividend, although this is not generally anticipated. Recent results of industrial companies have indicated a cautious policy in regard to dividends; and this is understandable because it is difficult to assess many of the problems arising from the return to peace-time working. Following the sharp reaction in textile shares towards the end of last week, prices showed partial recovery, Courtaulds, after 52s. 10½d., rallying to 54s., while British Celanese, no better than 31s. at one time, were later 32s. Fine Spinners recovered to 23s. 4½d., Calico Printers to 18s. 1½d., Bleachers to 13s., and Bradford Dyers to 23s. 10½d.

The iron-coal section also rallied, Stewarts & Lloyds at 54s., Babcock & Wilcox at 54s., Powell Duffryn at 22s. 3d., Staveley at 48s. 3d., and Thomas & Baldwins at 11s. 9d. regaining part of earlier declines. Gas Light & Coke receded to 22s. 4½d. Elsewhere, Borax Consolidated deferred were 40s., British Aluminium 43s. 3d., Dunlop Rubber 48s., and Radiation 58s. United Molasses declined to 40s. 1½d., recovering later to 40s. 9d. De La Rue at £10¼ were above their lowest in the past few days; British Industrial Plastics 2s. shares were 7s., and Erinoid 12s. British Glues & Chemical 4s. shares kept firm at 10s. 6d., awaiting the financial results.

Elsewhere, Triplex Glass, following 39s. 6d., recovered to 40s. 6d. British Match were 42s. 6d., Lever & Unilever 45s., and Wall Paper Manufacturers deferred 42s. Burt Boulton kept at 27s., Greeff-Chemicals Holdings 5s. ordinary at 9s., and Monsanto Chemicals 5½ per cent. preference at 23s., while Nairn & Greenwich have been steady at 76s. 3d., with Barry & Staines, at 51s. 3d., lower on balance. British Drug Houses were 32s. xd.

Boots Drug, down to 53s. 3d. towards the end of last week, have since rallied to 54s. 6d. Sangers were 30s. 6d., Timothy Whites 42s. xd, and Griffiths Hughes 37s. xd., the last-named being helped by the higher dividend. In other directions, Birmid Industries moved back to 93s. Oil shares reacted, but later firmed up a little, sentiment being aided by the higher Burmah Oil profits and the increased V.O.C. dividend. Ultramar Oil recovered to 74s. 9d., with the new shares changing hands at 5s. premium.

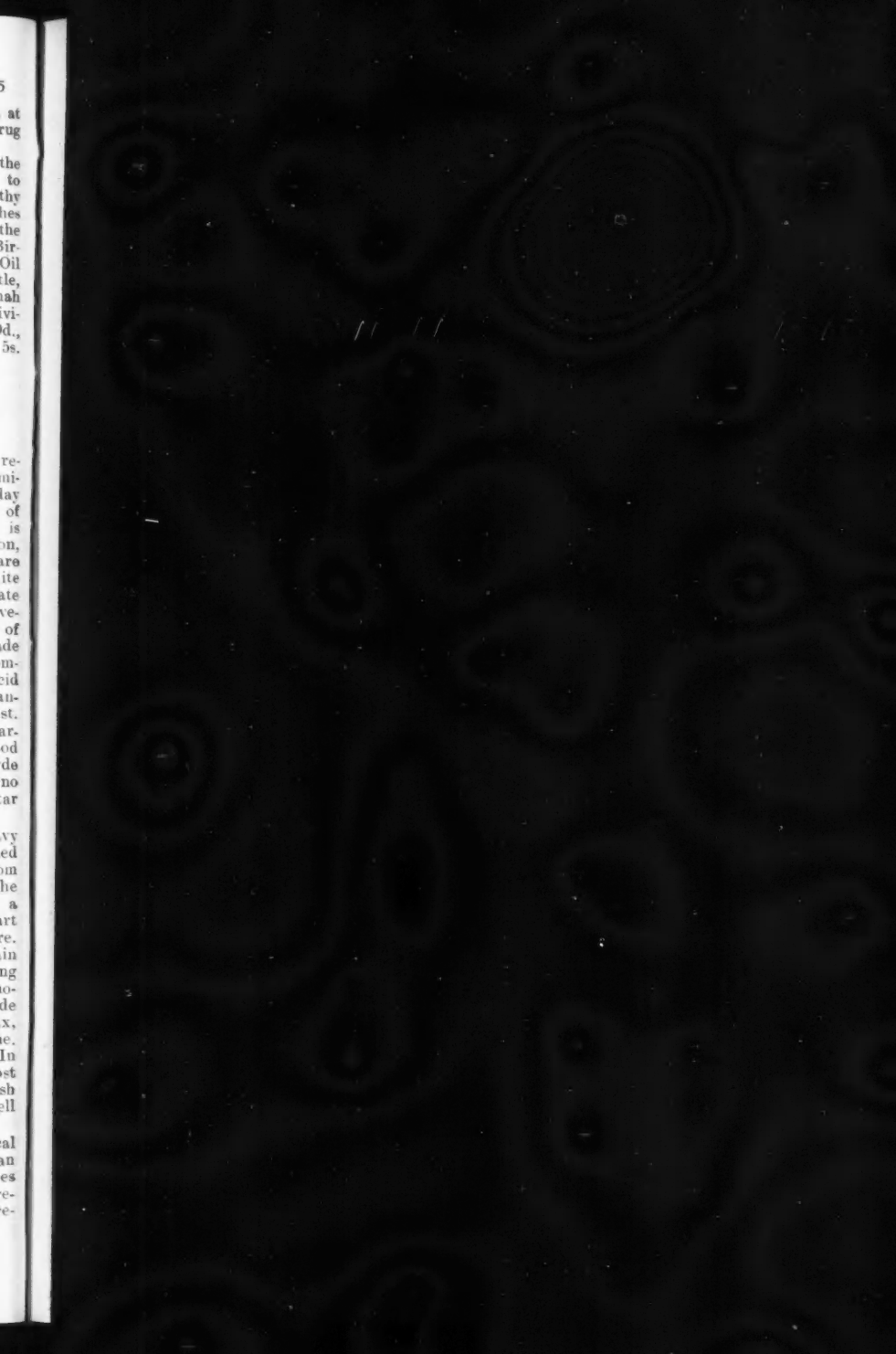
British Chemical Prices

Market Reports

QUIET conditions have again been reported from the London general chemicals market this week, the Whitsun holiday having apparently affected all sections of the market; but an early improvement is expected. In the soda products section, nitrate of soda and bicarbonate of soda are receiving a moderate inquiry; hyposulphite of soda is steady and there is a moderate demand for acetate of soda. No improvement is reported in the supply position of yellow prussiate of soda. A routine trade continues to operate among the potash compounds, supplies of which are scarce. Acid phosphate of potash is steady, and permanganate of potash is firm and in good request. In other directions acetone, sodium bicarbonate, and peroxide of hydrogen are good markets, while the demand for formaldehyde has been well maintained. There is no change to report in the market for coal-tar products, which remains quiet.

MANCHESTER.—The market for heavy chemical products this week has opened fairly satisfactorily after a dull period from the trading point of view as a result of the Whitsun holidays which pretty well put a stop to serious business for the greater part of the week in many parts of Lancashire. Deliveries are now going forward again steadily in caustic soda and other leading soda compounds, the heavy acids, the ammonia and magnesia products, and a wide range of other chemicals, including borax, alum, bleaching powder, and chlorine. Prices remain steady to firm throughout. In the coal-tar products, good deliveries of most descriptions have been called for, and fresh inquiry concerning shipment orders as well as from home users has been reported.

GLASGOW.—The Scottish heavy chemical trade during the past week has shown an improvement for the home trade. Prices remain firm with no actual changes to report. Export inquiries are still being received regularly.



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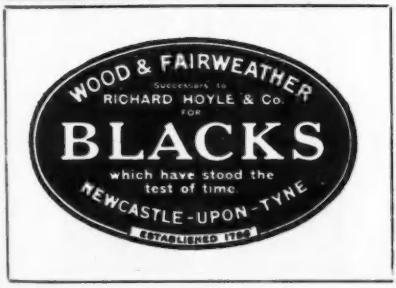

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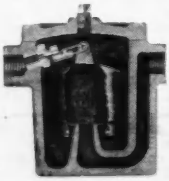

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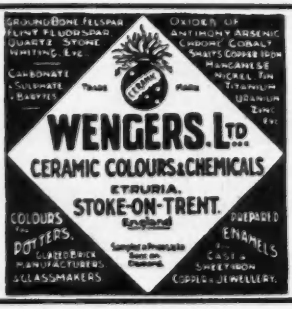

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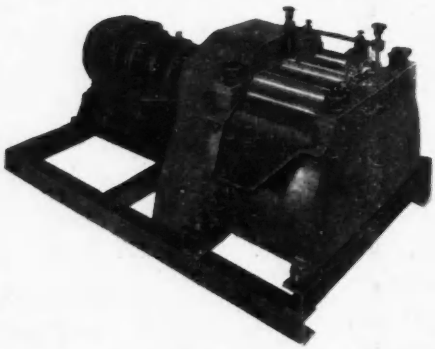

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